

WHAT IS CLAIMED IS:

1. A method of growing a metal silicate film on a substrate by atomic layer deposition comprising:

5 (i) introducing a metal organic precursor and a silicon organic precursor into a reaction chamber containing a substrate;

(ii) purging the reaction chamber;

(iii) introducing ozone into the reaction chamber;

(iv) purging the reaction chamber; and

10 (v) repeating steps (i), (ii), (iii) and (iv) until a film of a target thickness is achieved on the substrate.

2. The method of claim 1, wherein the substrate is silicon.

15 3. The method of claim 1, wherein the metal in the metal organic precursor is a Group 4 metal.

4. The method of claim 1, wherein the metal in the metal organic precursor is hafnium.

20 5. The method of claim 1, wherein the metal organic precursor is a linear, branched and cyclic alkyl.

25 6. The method of claim 1, wherein the metal organic precursor is a metal alkyl amide.

7. The method of claim 1, wherein the silicon organic precursor is a silicon alkyl amide.

30 8. The method of claim 1, wherein the metal organic precursor is a metal alkoxide.

9. The method of claim 1, wherein the metal organic precursor and the silicon organic precursor are mixed, volatilized, and introduced into the chamber as a mixed gas.

5 10. The method of claim 1, wherein the metal organic precursor and the silicon organic precursor are volatilized separately and introduced into the chamber concurrently.

10 11. The method of claim 1, wherein the metal organic precursor and the silicon organic precursor are volatilized separately and introduced into the chamber consecutively.

12. A method of forming a gate for a transistor comprising:

- 15 (i) introducing a metal organic precursor and a silicon organic precursor into a reaction chamber containing a substrate;
- (ii) purging the reaction chamber;
- (iii) introducing ozone into the reaction chamber;
- (iv) purging the reaction chamber;
- (v) repeating steps (i), (ii), (iii) and (iv) until a dielectric film of a target
- 20 thickness is achieved on the substrate; and
- (vi) placing a conductive film over the dielectric film.

13. The method of claim 12, wherein the substrate is silicon.

25 14. The method of claim 12, wherein the metal organic precursor is a linear, branched, and cyclic amide of Group 4 metal and wherein the silicon organic precursor is a silicon donating organic material.

30 15. The method of claim 12, wherein the metal organic precursor is a metal alkyl amide of a Group 4 metal, and wherein the silicon organic precursor is a silicon alkyl amide.

16. The method of claim 12, wherein the metal organic precursor and the silicon organic precursor are mixed, volatilized, and introduced into the chamber as a mixed gas.

5 17. The method of claim 12, wherein the metal organic precursor and the silicon organic precursor are volatilized separately and introduced into the chamber concurrently.

10 18. The method of claim 12, wherein the metal organic precursor and the silicon organic precursor are volatilized separately and introduced into the chamber consecutively.

19. A method of forming a capacitor comprising:

- 15 (i) introducing a metal organic precursor and a silicon organic precursor into a reaction chamber containing a substrate;
- (ii) purging the reaction chamber;
- (iii) introducing ozone into the reaction chamber;
- (iv) purging the reaction chamber;
- (v) repeating steps (i), (ii), (iii) and (iv) until a dielectric film of a target
- 20 thickness is achieved on the substrate; and
- (vi) positioning the film between two electrodes.

20. The method of claim 19, wherein the substrate is one of the two electrodes.

25 21. The method of claim 19, wherein the metal organic precursor is a linear, branched and cyclic amide of Group 4 metal and wherein the silicon organic precursor is a silicon donating organic material.

30 22. The method of claim 19, wherein the metal organic precursor is a metal alkyl amide of a Group 4 metal, and wherein the silicon organic precursor is a silicon alkyl amide.

23. The method of claim 19, wherein the metal organic precursor and the silicon organic precursor are mixed, volatilized, and introduced into the chamber as a mixed gas.

5 24. The method of claim 19, wherein the metal organic precursor and the silicon organic precursor are volatilized separately and introduced into the chamber concurrently.

10 25. The method of claim 19, wherein the metal organic precursor and the silicon organic precursor are volatilized separately and introduced into the chamber consecutively.